HISTORIC COLUMBIA RIVER HIGHWAY,
EAST MULTNOMAH FALLS VIADUCT
(Bridge No. 841)
Troutdale vicinity
Multnomah County
Oregon

HAER No. OR-36-J

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
P.O. Box 37127
Washington, D.C. 20013-7127

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HISTORIC AMERICAN ENGINEERING RECORD

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Note: For shelving purposes at the Library of Congress, Troutdale vicinity in Multnomah County was selected as the "official" location for the various structures in the Historic Columbia River Highway documentation.

Brian Grogan, Photographer, June 1994.

HAER No. OR-36-J-1 EAST MULTNOMAH FALLS VIADUCT, VIEW LOOKING 62 DEGREES EAST-NORTHEAST.

HAER No. OR-36-J-2 EAST MULTNOMAH FALLS VIADUCT, DETAIL VIEW LOOKING 152 DEGREES SOUTHEAST.

Jet Lowe, HAER Photographer, July 1995.

HAER No. OR-36-J-3 EAST MULTNOMAH FALLS VIADUCT, FIRST SECTION OF PANORAMIC VIEW, VIEW LOOKING WEST-SOUTHWEST.

HAER No. OR-36-J-4 EAST MULTNOMAH FALLS VIADUCT, SECOND SECTION OF PANORAMIC VIEW, DETAIL OF HALF-VIADUCT STRUCTURE.

HAER No. OR-36-J-5 EAST MULTNOMAH FALLS VIADUCT, THIRD SECTION OF PANORAMIC VIEW, DETAIL OF HALF-VIADUCT.

HAER No. OR-36-J-6 EAST MULTNOMAH FALL VIADUCT, FOURTH SECTION OF PANORAMIC VIEW, LOOKING EAST-NORTHEAST.

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HISTORIC AMERICAN ENGINEERING RECORD

HISTORIC COLUMBIA RIVER HIGHWAY, EAST MULTNOMAH FALLS VIADUCT (Bridge No. 841)

HAER No. OR-36-J

Location:	Carrying the Historic Columbia River Highway between cliffs and the railroad right-of-way east of Multnomah Falls, Multnomah County, Oregon, beginning at milepost 32.3.
Date of Construction:	1914
Engineer:	K. P. Billner, designing engineer, Oregon State Highway Department
Builder:	Pacific Bridge Company, Portland
Owner:	Oregon Department of Transportation
Present Use:	Vehicular traffic
Significance:	This 860' half-viaduct was an engineer's solution to aligning the Historic Columbia River Highway between a steep unstable slope and the Oregon Washington Railroad and Navigation Company main line right-of-way. It is a companion to the West Multnomah Falls Viaduct (HAER No. OR-36-G).
Historian:	Robert W. Hadlow, Ph.D., September 1995
Transmitted by:	Lisa M. Pfueller, September 1996

PROJECT INFORMATION

This recording project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. The HAER program is administered by the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Division of the National Park Service, U.S. Department of the Interior. The Historic Columbia River Highway Recording Project was cosponsored in 1995 by HABS/HAER, under the general direction of Robert J. Kapsch, Ph.D., Chief, and by the Oregon Department of Transportation (ODOT), Bruce Warner, Region One Manager; in cooperation with the US/International Committee on Monuments and Sites (ICOMOS), the American Society of Civil Engineers (ASCE), and the Historic Columbia River Highway Advisory Committee.

Fieldwork, measured drawings, historical reports, and photographs were prepared under the direction of Eric N. DeLony, Chief of HAER; Todd A. Croteau, HAER Architect, and Dean A. Herrin, Ph.D., HAER Historian. The recording team consisted of Elaine G. Pierce (Chattanooga, Tennessee), Architect and Field Supervisor; Vladimir V. Simonenko (ICOMOS/Academy of Fine Arts, Kiev, Ukraine), Architect; Christine Rumi (University of Oregon) and Pete Brooks (Yale University), Architectural Technicians; Helen I. Selph (California State Polytechnic University, Pomona) and Jodi C. Zeller (University of Illinois, Urbana-Champaign), Landscape Architectural Technicians; Robert W. Hadlow, Ph.D. (ASCE/Pullman, Washington), Historian; and Jet Lowe (Washington, DC), HAER Photographer. Jeanette B. Kloos, ODOT Region One Scenic Area Coordinator; and Dwight A. Smith, ODOT Cultural Resources Specialist, served as department liaison.

Additional information about the Historic Columbia River Highway can be found under the following HAER Nos.:

OR-36	HISTORIC COLUMBIA RIVER HIGHWAY
OR-36-A	HISTORIC COLUMBIA RIVER HIGHWAY, SANDY RIVER BRIDGE AT TROUTDALE
OR-36-B	HISTORIC COLUMBIA RIVER HIGHWAY, SANDY RIVER BRIDGE (Stark St. Bridge)
OR-36-C	HISTORIC COLUMBIA RIVER HIGHWAY, CROWN POINT VIADUCT
OR-36-D	HISTORIC COLUMBIA RIVER HIGHWAY, CROWN POINT
OR-24	LATOURELL CREEK BRIDGE
OR-23	SHEPPERDS DELL BRIDGE
OR-36-E	HISTORIC COLUMBIA RIVER HIGHWAY, BRIDAL VEIL FALLS BRIDGE
OR-36-F	HISTORIC COLUMBIA RIVER HIGHWAY, WAHKEENA FALLS FOOTBRIDGE

OR-36-G	HISTORIC COLUMBIA RIVER HIGHWAY, WEST MULTNOMAH FALLS VIADUCT
OR-36-H	HISTORIC COLUMBIA RIVER HIGHWAY, MULTNOMAH CREEK BRIDGE
OR-36-I	HISTORIC COLUMBIA RIVER HIGHWAY, MULTNOMAH FALLS FOOTBRIDGE (Benson Footbridge)
OR-36-K	HISTORIC COLUMBIA RIVER HIGHWAY, ONEONTA GORGE CREEK BRIDGE
OR-36-L	HISTORIC COLUMBIA RIVER HIGHWAY, ONEONTA TUNNEL
OR-36-M	HISTORIC COLUMBIA RIVER HIGHWAY, HORSETAIL FALLS BRIDGE
OR-49	MOFFETT CREEK BRIDGE
OR-36-N	HISTORIC COLUMBIA RIVER HIGHWAY, TOOTHROCK & EAGLE CREEK VIADUCTS
OR-36-O	HISTORIC COLUMBIA RIVER HIGHWAY, TOOTHROCK TUNNEL
OR-36-P	HISTORIC COLUMBIA RIVER HIGHWAY, EAGLE CREEK BRIDGE
OR-36-Q	HISTORIC COLUMBIA RIVER HIGHWAY, EAGLE CREEK RECREATION AREA (Forest Camp)
OR-36-R	HISTORIC COLUMBIA RIVER HIGHWAY, MITCHELL POINT TUNNEL & VIADUCT (Tunnel of Many Vistas)
OR-36-T	HISTORIC COLUMBIA RIVER HIGHWAY, MOSIER TWIN TUNNELS
OR-36-U	HISTORIC COLUMBIA RIVER HIGHWAY, MOSIER CREEK BRIDGE (Bridge No. 498)
OR-30	DRY CANYON CREEK BRIDGE
OR-27	MILL CREEK BRIDGE
OR-56	COLUMBIA RIVER HIGHWAY BRIDGES

For shelving purposes at the Library of Congress, Troutdale vicinity in Multnomah County was selected as the "official" location for the various structures in the Historic Columbia River Highway documentation (HAER No. OR-36).

HISTORIC COLUMBIA RIVER HIGHWAY

The Pacific Northwest's Columbia River Highway, later renamed the Historic Columbia River Highway (HCRH), was constructed between 1913 and 1922. It is one of the oldest scenic highways in the United States. Its design and execution were the products of two visionaries: Samuel Hill, lawyer, entrepreneur, and good roads promoter and Samuel C. Lancaster, engineer and landscape architect, with the assistance of several top road and bridge designers. In addition, many citizens provided strong leadership and advocacy for construction of what they saw as "The King of the Roads."

Often, the terms "scenic highways" and "parkways" are used synonymously. Scenic highways are best described as those roads constructed to provide motorists with the opportunity to see up-close the landscape's natural beauty. Parkways are roads or streets often associated with city beautiful campaigns prevalent in the United States in the late 19th and early 20th centuries. They were part of a movement to create park-like settings out of wastelands. Many of the scenic highways in the United States are associated with the country's national park system and were built in the years following the First World War.

Beginning in the 1910s and early 1920s, the National Park Service (NPS) began construction of well-engineered paved roads with permanent concrete and masonry bridges and viaducts to make its park sites more accessible to an increasingly mobile tourist population. These included roads such as "Going-to-the-Sun Highway" in Glacier National Park and "All-Year Highway" in Yosemite National Park. The Historic Columbia River Highway, unlike many of its counterparts, was constructed through county-state cooperation. It became a state-owned trunk route or highway, part of a growing system of roads that criss-crossed Oregon.

Samuel Hill, once an attorney for James J. Hill and his large railroad empire, and later a Pacific Northwest investor and entrepreneur, was the state of Washington's most vocal good roads' spokesman in the late 19th and early 20th centuries. He promoted good roads at Seattle's Alaska-Yukon-Pacific Exposition in 1905, and shortly thereafter helped to establish the department of highway engineering at the University of Washington. With little success in convincing the Washington State Legislature to fund a major highway along the Washington side of the Columbia River, Hill found more receptive ears and pocketbooks with Oregon lawmakers and Portland area businessmen. Construction began on the Historic Columbia River Highway in

1913. By 1922, it was complete, covered in a long-wearing and smooth-riding asphaltic-concrete pavement.[1]

Hill hired Samuel Lancaster, an experienced engineer and landscape architect to design the Historic Columbia River Highway. Lancaster was noted for the boulevards that he created around Seattle's Lake Washington in the first decade of the 20th century as a component of the city's Olmsted-designed park system. In 1909 Lancaster became the first professor of highway engineering in Hill's department at the University of Washington. Lancaster had accompanied Hill and others to Paris in 1908 for the First International Road Congress, and afterwards the delegation toured western Europe to learn about continental road-building techniques. Seeing roads in the park-like setting of the Rhine River Valley inspired Hill to build a highway along the Columbia River Gorge. By 1912, Lancaster was conducting road-building experiments at Hill's estate, Maryhill, 100 miles east of Portland on the Washington side of the Columbia. The route they subsequently created was not a parkway, in the truest sense, but instead a scenic highway.[2]

The Columbia River Gorge's natural features distinguish it as the ideal setting. This relationship between the natural landscape and the Historic Columbia River Highway was described best by locating engineer John Arthur Elliott. He wrote, "All the natural beauty spots were fixed as control points and the location adjusted to include them." The road passed several waterfalls and rock outcroppings, including Thor's Heights (Crown Point), Latourell Falls, Shepperd's Dell, Bishop's Cap, Multnomah Falls, Oneonta Gorge and Falls, Horsetail Falls, Wahkeena Falls, and Tooth Rock. Natural features were made an integral component of the HCRH.[3]

According to Lancaster, "There is but one Columbia River Gorge [that] God put into this comparatively short space, [with] so many beautiful waterfalls, canyons, cliffs and mountain domes." He believed that "men from all climes will wonder at its wild grandure [*sic*] when once it is made accessable [*sic*] by this great highway." In addition, the promoters sought to create a route that utilized the most advanced techniques available for road construction. In reflecting on the work's progress, Lancaster acknowledged that because of the country's rugged climate, with its wind and rain and winter weather, it had been "slow and tedious and somewhat more expensive than ordinary work." Nevertheless, he and his associates felt they were accomplishing a worthwhile task because, "for if the road is completed according to plans, it will rival if not surpass anything to be found in the civilized world."[4]

In an more practical light, many observers saw the HCRH as a lifeline connecting Portland with the many commercial and agricultural areas along the Columbia River. Some even envisioned it as part of a spider web of similarly constructed routes radiating out towards central and eastern Washington, and northern Idaho, meeting routes leading to other parts of the region and nation.

The Historic Columbia River Highway was a technical and civic achievement of its time, successfully mixing sensitivity to the magnificent landscape and ambitious engineering. The highway has gained national significance because it represents one of the earliest applications of cliff-face road building as applied to modern highway construction. Lancaster emulated the European styles of road building in the Columbia River Gorge, while also designing and constructing a highway to advanced engineering standards. Throughout the route, engineers held fast to a design protocol that included accepting no grade greater than 5 percent, nor laying out a curve with less than a 200' turning radius. In rare cases where a tighter curve was used, Lancaster reduced grades and widened pavement. The use of reinforced-concrete bridges, combined with masonry guard rails, guard walls, and retaining walls brought together the new with the old - the most advanced highway structures with the tried and tested. In building the HCRH, Lancaster artfully created an engineering achievement sympathetic to the natural landscape.[5]

In the days before the formation of a comprehensive state highway plan, Multnomah, Hood River, and Wasco counties cooperated, sometimes unwillingly, with the newly-formed Oregon State Highway Commission (1913) in constructing the Historic Columbia River Highway. Initially a group of recently elected Multnomah County commissioners, strong supporters of the proposed route, resolved that the highway commission take charge of its road building activities, with access to $75,000 in county tax revenues. Soon crews surveyed the route through Multnomah County and constructed one mile of road.

Boosters stumped for the route's completion to the Hood River County line. Local clubs sent out men and boys for weekend work parties to show public support for the undertaking. One photograph from the period, depicts work parties with picks and shovels in hand and placards such as "Gang No. 7, Portland Ad Club, Stalwarts," or "Gang No. 3, Portland Realty Board, We will ROCK the Earth." The highway received much patronage, although some citizens were less than enthusiastic about its construction. Opponents showed their views with placards declaring, "I WON'T WORK, To Hell With Good Roads, We Don't Own Autos." Many "mossbacks" had no use for good roads and were satisfied

traveling the network of rutted, narrow, steeply-graded backwoods trails. Nevertheless, the public generally supported the highway's construction. Multnomah County Commissioners levied a direct tax sufficient to fund road building to the Hood River County line, and subsequently, the people voted a $1 million bond issue to pave the road with asphalt.[6]

Other counties similarly supported this scenic highway innovation. In 1914, Hood River County voters approved the sale of $75,000 in bonds to initiate their portion of the road's construction. Finally, in 1915, Wasco County commissioners financed a survey to locate the route through their jurisdiction. By 1916, though, the state highway commission was reorganized and given a greater mandate over state highway construction, taking much of it out of local hands. Passage of the Federal Aid Road Acts of 1916 and 1921 gave the Oregon State Highway Commission matching funding to complete the Historic Columbia River Highway through Wasco County, and eventually to complete the route to its eastern terminus at Pendleton, in Umatilla County, by the early 1920s. At the same time, the state, working with counties west of Portland, completed another portion of the Columbia River Highway to the sea at Astoria. Eventually it became part of the national highway system and was designated part of U.S. 30.[7]

By the late 1930s, construction of Bonneville Dam, a New Deal project aimed at providing flood control on the Columbia River and generating electricity, caused a realignment of a portion of the Historic Columbia River Highway near Tooth Rock and Eagle Creek, in eastern Multnomah County. It was evident that the old highway was too outdated to provide safe, efficient travel for modern motor traffic. By 1954 it was bypassed in its entirety from Troutdale to The Dalles by a new water-level route. This new road was subsequently upgraded to a four-lane divided roadway and eventually renamed Interstate 84. Only portions of the old route remained as a reminder of its early modern highway engineering accomplishments.

EAST MULTNOMAH FALLS VIADUCT

From Crown Point Viaduct (HAER No. OR-36-C) to Horsetail Falls Bridge (HAER No. OR-36-M), a distance of nearly eleven miles, the Historic Columbia River Highway passes by one of the best collections of high waterfalls in North America. In the middle, the West and East Multnomah Falls viaducts (HAER Nos. OR-36-G and OR-36-J) run parallel to the Oregon Washington Railroad and Navigation Company (OWRN) line and the Columbia River, between the tracks and a steep mountainside. They carry the Historic Columbia River Highway east and west of Multnomah Falls,

a 620' cataract which is one of the tallest on the continent, attracting visitors for centuries. Multnomah Falls was one of the destinations that Lancaster wished to include on his highway. Furthermore, there were no realistic alternate alignments for the HCRH in this section because the OWRN's mainline ran through the narrow passageway between the mountains and the river.

Lancaster avoided marring the natural beauty of the landscape wherever possible. He often saw the best solution to creating satisfactory road alignments as simply constructing the road on fill behind solid dry masonry retaining walls. In creating the West and East Multnomah Falls viaducts he also faced the problem of bridging very steep and unstable rock slopes that were susceptible to slide action. Even minimal cutting and filling at the toe of these mountainsides, held together by underbrush and timber, might cause avalanches of rock and debris to cover the roadway and, probably more importantly, block the OWRN's main line. Finally, the costs alone for excavating the toe of the mountainside were prohibitive, and authorization by the OWRN to carry materials across its main line to dump in the river was not possible. Lancaster's solution to the problem was to employ viaducts resting on unequal length columns, anchored to the slopes and nearly overhanging the OWRN right-of-way.[8]

DESIGN AND DESCRIPTION

The East Multnomah Falls Viaduct is 860' in length and originally consisted of forty-three 20' reinforced-concrete slab spans. The deck was supported by two parallel rows of 16"-square columns, or bents, 17'-6". The corners are chamfered, both for aesthetic purposes, and to eliminate sharp corners prone to chipping. This shape also facilitated removing the formwork. Roadway width is about 18'. The design engineer K. P. Billner included inclined struts between the footings of the inside and outside piers because he saw a need to guard against settling of the upper columns and to achieve greater structural stability. With confidence he believed that they could "carry the weight of the structure."[9]

A theme carried throughout the Historic Columbia River Highway was the use of arches in concrete and masonry structures. Most of the larger bridges on the route take the arch form, and arched drainage openings were incorporated into the design of most masonry guard rails. On the West and East Multnomah Falls viaducts, along with the Oneonta Gorge Creek Bridge, the Horsetail Falls Bridge, and other structures on the Pacific Highway, designers used a delicate post and arch coursing. It consisted of a beveled cap of reinforced-concrete and plaster arches reinforced with hyrib lath and separated at regular

intervals with concrete posts. The entire guard fence rested on a concrete curb. Finally, because the East Multnomah Falls Viaduct's south elevation abutted the mountainside, the concrete railing was used only on the north elevation, paralleling the OWRN rail line, and a taller curb-like reinforced-concrete retaining wall formed the roadway barrier on the mountainside elevation. The East Multnomah Falls Viaduct cost $22,520.83.[10]

REPAIR AND MAINTENANCE

Maintenance records at the Oregon Department of Transportation Bridge Section, located in Salem, do not exist for the East Multnomah Falls Viaduct. Nevertheless, it is known from newspaper accounts that in late November 1921, a strong winter storm covered the Columbia River Gorge with a heavy blanket of sleet, snow, and ice. Upon inspecting structures along the HCRH for damage in the aftermath of the storm, Samuel Lancaster noted that there was so much snow and ice piled on the West and East Multnomah Falls viaducts that they were both in danger of collapse. Shortly, the Multnomah County Roadmaster and several engineers inspected the viaducts and found that several bents on the mountain side of the east viaduct had sunk into the unstable slope, causing some rotation in the structure. The Roadmaster contemplated sending out trucks and men with shovels to remove the snow, but by the time they reached the viaducts, the snow would have melted. As a more reasonable alternative he thought about ordering crews to put in place temporary jacks to shore up the deck.[11]

It appears that the Roadmaster delayed action on the matter because several days later Lancaster became very irritated that nothing had been done. He pleaded with the Multnomah County Commissioners and officials of the OWRN that if crews did not install jacks in the failed sections of the east viaduct immediately that the structure might collapse, sending steel and concrete rubble on to the OWRN main line. It was to no avail, and the county commissioners decided to wait for the snow to melt.[12]

Several alterations were made to the east viaduct after the 1921 storm. Conde B. McCullough's Bridge Department in the Salem offices of the Oregon State Highway Department created a design calling for sets of 10" x 10" intermediate posts placed mid-span and resting on concrete footings that straddled the inclined struts between existing bents. It also designed replacement 12" x 12" reinforced-concrete columns for those that failed. Finally, the designers created wall systems running transversely at the midpoint of each girder span from north elevation to south elevation, under the deck for added structural stability. These

consisted of three 12" x 12" columns equally spaced and infilled with concrete walls reinforced with ½ bars placed in a grid pattern at 4'-0" centers. The bases of all footings measured 3'-0" x 3'-0".[13]

Since the 1920s, maintenance activities on either the east or west viaduct is unknown. Both are very narrow for modern road standards and have received many scrapes and gouges from automobiles with large overhanging mirrors. In the early 1990s, an Oregon Department of Transportation mason recast the concrete plaster outer guardrail on both viaducts as part of a long-term rehabilitation program for historic road resources along the Historic Columbia River Highway.

ENDNOTES

[1]For good syntheses of the Pacific Northwest good roads' movement, see John Kevin Rindell, "From Ruts to Roads: The Politics of Highway Development in Washington State" (M.A. thesis, Washington State University, 1987) and Hugh M. Hoyt, Jr., "The Good Roads Movement in Oregon, 1900-1920" (Ph.D. diss., University of Oregon, 1966); Oral Bullard, *Lancaster's Road: The Historic Columbia River Scenic Highway* (Beaverton, OR: TMS Book Service, 1982): 31; Ronald J. Fahl, "S. C. Lancaster and the Columbia River Highway: Engineer as Conservationist," *Oregon Historical Quarterly* 74, no. 2 (June 1973): 112.

[2]Fahl, "S. C. Lancaster and the Columbia River Highway," 105-07.

[3]John Arthur Elliott, "The Location and Construction of the Mitchell Point Section of the Columbia River Highway" (C.E. thesis, University of Washington, 1929): 3.

[4]Samuel C. Lancaster to Amos S. Benson, 7 February 1914, folder "Multnomah County, 1914," box 4, RG 76A-90, Oregon State Archives, Salem.

[5]Dwight A. Smith, "Columbia River Highway Historic District: Nomination of the Old Columbia River Highway in the Columbia Gorge to the National Register of Historic Places, Multnomah, Hood River, and Wasco Counties, Oregon" (Salem, OR: Oregon Department of Transportation, Highway Division, Technical Services Branch, Environmental Section, 1984): 3.

[6]Ronald J. Fahl, "S. C. Lancaster and the Columbia River Highway: Engineer as Conservationist," *Oregon Historical Quarterly* 74, no. 2 (June 1973): 111; Samuel C. Lancaster, "The Revelation of Famous Highways: A Symposium,"in *American Civic Annual* (n.p., 1929): 109.; see photograph in the Oregon Historical Society collection, negative no. 38744; C. Lester Horn, "Oregon's Columbia River Highway," *Oregon Historical Quarterly* 66, no. 3 (September 1965): 261.

[7]*Second Annual Report of the Engineer of the Oregon State Highway Commission* (Salem, 1916): 26-30.

[8]George C. Warren, "The Columbia River Highway," *Contracting* (May 1916): 2; "The Columbia River Highway in Multnomah County," by Samuel C. Lancaster, Consulting Highway Engineer, Assistant Highway Engineer, in *First Annual Report of the State Highway Engineer* (Salem, 1914): 64; [untitled typed manuscript by K. P.

Billner] in folder "Multnomah County, 1914," box 4, RG 76A-90, Oregon State Archives, Salem, 4.

[9][untitled typed manuscript by K. P. Billner] in folder "Multnomah County, 1914," box 4, RG 76A-90, Oregon State Archives, Salem, 4.

[10]See separate Historic American Engineering Record historical reports for Oneonta Gorge Creek Bridge, HAER No. OR-76; Horsetail Falls Bridge, HAER No. OR-78; and East Multnomah Falls Viaduct, HAER No. OR-25; *First Annual Report of the State Highway Engineer* (Salem, 1914): 50.

[11]"Highway Viaduct in Danger, Says Sam Lancaster; Urges County Commissioners to Relieve Strain on Columns of Structures Near Multnomah Falls," *Portland Oregon Journal* (4 December 1921): sec. 1, p. 2; "Immediate Peril to Two Viaducts is Declared Past," *Portland Oregon Journal* (2 December 1921): 2.

[12]"Immediate Peril to Two Viaducts is Declared Past," *Portland Oregon Journal* (2 December 1921): 2; "Highway Viaduct in Danger, Says Sam Lancaster; Urges County Commissioners to Relieve Strain on Columns of Structures Near Multnomah Falls," *Portland Oregon Journal* (4 December 1921): sec. 1, p. 2; *Fifth Biennial Report of the Oregon State Highway Commission* (Salem: 1922): 424.

[13]See "East Viaduct at Multnomah Falls," Drawing No. 1725, Bridge No. 841, in Drawing File, Bridge Section, ODOT, Salem; Shortly before the Oregon State Highway Department completed these plans for rebuilding the East Multnomah Falls Viaduct it drew up a previous plant to shore up the structure with wooden beams, screw jacks, and wedges. Drawing No. 1725 superseded this plan. See "East Viaduct at Multnomah Falls," Drawing No. 1694, Bridge No. 841, in Drawing File, Bridge Section, ODOT, Salem.

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DATA LIMITATIONS

The written record available on the East Multnomah Falls Viaduct includes notations in several period articles on the HCRH's construction, in official Oregon State Highway Department reports, and in various correspondence files. Early maintenance records for this structure were unavailable or no longer exist, but the near collapse of the West and East Multnomah Falls viaducts in 1921 created much official correspondence and newspaper coverage.

APPENDIX - VIADUCTS

Viaducts, often bridges resting on a series of narrow reinforced-concrete piers or bents and carrying a road over a valley, cleft, or concavity, have many forms on the Historic Columbia River Highway. They were used primarily to keep construction costs down when alternative road alignments meant expensive grading or "developing distance" by building extra lengths of road to maintain a grade no greater that 5 percent.

FULL VIADUCTS

Mitchell Point Viaduct (HAER No. OR-36-R)

At the west approach to Mitchell Point Tunnel (HAER No. OR-36-R), engineers designed a 193'-0" reinforced-concrete slab and girder type viaduct. The viaduct was supported on sets of columns 15'-6" apart center-to-center, and 32'-0" longitudinally to carry the HCRH from a cliff cut over a talus slope concavity to a tunnel portal. Locating this structure was difficult because the talus slope below over was unstable, making it hard for crews to locate firm footings for bents. Excavations were done by hand and proved very time consuming.

The Mitchell Point Viaduct was a fairly nondescript structure with precast railing panels. Yet it was functional with an understated aesthetic component that prepared motorists for entering the Mitchell Point Tunnel, which some have called the most inspiring part of the HCRH. The tunnel and viaduct were completed in 1915. A new water-grade route for U.S. 30, mostly built on fill from river dredging, was completed from Portland to The Dalles by the early 1950s. Oregon highway officials closed Mitchell Point Tunnel and consequently the adjoining viaduct in 1953 and backfilled the tunnel in an attempt to stabilize the basalt formations of Mitchell Point. In 1966, as part of a widening project to upgrade the water-level route to a four-lane interstate highway, a large portion of Mitchell Point, including the tunnel and viaduct, were destroyed.

HALF-VIADUCTS

Engineers designed half-viaducts for several locations on the highway also to skirt hillsides. They were constructed much like viaducts with unequal-length columns, except that the inside bents consisted only of footings and the inside elevations were anchored into the hillsides or masonry walls. Because of the half-viaducts' inconspicuous design, motorists often did not realize that they were not traveling on regular highway pavement with masonry guard rails.

Crown Point Viaduct (HAER No. OR-36-C)

The Crown Point Viaduct (HAER No. OR-36-C), completed in 1914, is 560' and consists of twenty-eight 20' reinforced-concrete deck slabs. It was a half-viaduct designed to create a 7' sidewalk and curb adjacent to a tightly curved section of the Historic Columbia River Highway on a high basalt promontory. Its design also included a 4' concrete outer railing and concrete light standards to illuminate the point at night. Samuel Lancaster saw Crown Point, originally called Thor's Heights for the Norse god of thunder, as a destination for motorists. Here they could see a panoramic view of the Columbia River Gorge and surrounding landscape, and begin their travels through the "waterfalls" section of the route.

Toothrock and Eagle Creek Viaducts (HAER No. OR-36-N)

High above the river, Toothrock and Eagle Creek Viaducts (HAER No. OR-36-N) (224') carried the highway around Toothrock, a tall basalt cliff, high above the river before dropping down to Eagle Creek. Their designs differ only in their railing treatment, where Toothrock Viaduct uses a concrete spindle and cap design, Eagle Creek Viaduct uses a masonry rail and concrete cap design. Their purpose was to minimize costs but create sound structures with an aesthetic component. Completed in 1915, they were abandoned in 1937 at the completion of Toothrock Tunnel and a new water-level realignment of the trunk route near Bonneville Dam.

Ruthton Point Viaduct

Ruthton Point Viaduct, completed in 1918, is a 50' structure consisting of three reinforced-concrete deck girder spans (20', 20', and 10') carrying the highway near a promontory west of Hood River. It used a simple standardized concrete railing panel and cap. It was bypassed when the new water-level route for U.S. 30 was completed in the early 1950s. Since then it fell into disrepair, but in the early 1990s, as part of an Oregon Department of Transportation restoration project on the Historic Columbia River Highway, Ruthton Point Viaduct was reconstructed to be part of a pedestrian and bicycle accessible trail along once abandoned sections of the route.

Rock Slide Viaduct

The 34' Rock Slide Viaduct, completed in 1920, lies a short distance west of the Mosier Twin Tunnels. The viaduct was probably necessary, rather than a dry masonry retaining wall, because of the unstable nature of the basalt slope. The viaduct's uninterrupted roadway surface and the continuous arched rubble parapet railing made it difficult for travelers to identify the structure from the road. In the late 1940s and early 1950s, the Oregon State Highway Department completed a

water-level route for U.S. 30 along the Columbia River. In 1953, it finished the section between Hood River and Mosier and closed the Mosier Twin Tunnels. The portion of the Historic Columbia River Highway from Hood River to the tunnels' west approach, including Rock Slide Viaduct, became part of Hood River County's extensive road system.